1,140,900

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Toilet Hygienic Device

We, JAMES WILLIAM EWING and DALE FRANK BEHRENDS, both citizens of the United States of America, of 138 East Hillwide Road, Barrington, Illinois, United States of America, and 13024 Fenton Avenue, Sylmar, California, United States of America, respectively, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a toilet hygienic device and, more particularly, to a device for spraying fluid into a toilet bowl for disinfecting, deodorising, and like purposes.

The present invention follows the teaching disclosed in our United States Patent No. 2,760,209, but incorporates certain advantageous changes therefrom which result in an unexpectedly superior operation. That United States patent Specification discloses a generally U-shaped tubular member adapted to be mounted over the rim of a toilet bowl which is compressed by weight on the associated toilet seat for expelling a quantity of fluid from the U-shaped member. By the present invention, a U-shaped member can be readily installed on a wide variety of rims in a secure and immobile fashion while at the same time developing a much greater internal compressive force for the expelling of fluid. It is an object of the invention to provide an improvement upon the device described in the earlier United States patent Specification.

A further and more specific object is to provide an improved dispensing device for mounting on a toilet bowl rim wherein structural features not only develop a superior gripping action relative to the toilet bowl, but at the same time result in advantageously greater internal compression when subjected to the weight stress of the toilet seat.

The invention aims to improve in several respects on devices of the kind in question, as to efficiency, adaptability, and reliability.

Other objects and advantages of the invention may be seen in the details of construction and operation set down in the following description.

The invention is explained by means of an illustrative embodiment with reference to the accompanying drawings in which:—

Fig. 1 is a fragmentary perspective view of a toilet showing the invention applied thereto;

Fig. 2 is an enlarged side elevational view, partially in section, of the portion of Fig. 1 featuring the dispensing device;

Fig. 3 is a view similar to Fig. 2 but showing the same in a different condition of operation, i.e., in the process of dispensing fluid under the action of a toilet seat when occupied;

Fig. 4 is an enlarged fragmentary sectional view of the discharge portion of the device;

Fig. 5 is a sectional view taken along the line 5—5 of Fig. 4;

Fig. 6 is an enlarged sectional view taken along the line 6—6 of Fig. 1;

Fig. 7 is a transverse sectional view taken along the line 7—7 of Fig. 2; and

Fig. 8 is an enlarged sectional view of part of the discharge nozzle of the device.

Referring to the drawings and in particular to Fig. 1, the numeral 10 designates generally a toilet bowl which is equipped with the usual rim 11. Affixed to the bowl in pivotal fashion is a toilet seat 12. Also pivotally mounted on the bowl 10 is the cover 13 and associated with the bowl 10 is the cistern 14.

Installed over the rim 11 is the improved fluid-dispensing device of this invention, which is generally designated 15.

With reference to Figure 2, the device 15 is seen to be generally U-shaped and hatched in the wall portion to indicate that it is constructed of a resilient synthetic plastics material. The tubular U-shape includes a

[*Price* 4*s.* 6*d.*]

first depending leg portion 16 which is adapted to project downwardly interiorly of the bowl 10 and is equipped with a discharge nozzle generally designated 17. The U-shape also includes a second depending leg portion 18 which extends down the outer side of the bowl 10 and which is, as seen in Fig. 6 of generally rectangular section. Interconnecting the two depending leg portions 16 and 18 is a connecting portion 19 of bulb-like shape which is seen to overlie the rim 11. The portions 18, 19 and 16 constitute, therefore, a relatively elongated tubular body, the leg portion 18 being partially filled with a hygienic fluid to be atomised (see Fig. 3) into the interior of the bowl 10 and onto the surface of the water 21 normally carried in the bowl. The water 21 may issue from the integral conduit 22 and discharge ports 23 provided as part of the rim 11.

In the illustrated form of the device 15, we mould the polyethylene in two portions as at 24 and 25 in Fig. 1. After moulding and installation of various internal parts, the halves 24 and 25 are united along a line 26, which indicates a join between the halves.

Fig. 6 is a sectional view of the longer, outer leg portion 18, and it is seen that the leg portion 18 is made up of an inside wall 27 and an outside wall 28 and end walls 29 and 30, to develop a generally rectangular cross-section. This same construction is present in the shorter first leg portion 16, while the connecting portion 19 is generally elliptical in transverse section, and bulbous, as can be appreciated from a consideration of Figs. 1 and 7. Thus, the end walls 29 and 30 found in the second leg portion 18 and the corresponding end walls in the shorter first leg portion 16 as seen in Fig. 4, merge into imaginary line in the regions 32 in Fig. 7—the upper and lower walls 33 and 34 respectively of the connecting portion 19 being essentially concavo-convex segments united along longitudinal lines of merger as at 32.

Reference to Figs. 2 and 4 reveals that the lower wall 34 of the connective portion 19 is longitudinally arcuate and concave as seen from the upper wall 33. Further, the lower wall 34 defines with the confronting inner walls 27 and 35 of the leg portions 18 and 16, respectively, relatively sharp angles as at θ in Fig. 4, of the order of about 20° to about 60°.

As can be appreciated from a comparison of Figs. 2 and 3, the angle θ enlarges due to depression of the toilet seat 12. This is due to the relative upward movement of the lower wall 34, which in certain instances may even be reversed in its longitudinal arcuity (i.e. beyond the flattened position seen in Fig. 3). This deformation is advantageous in keeping the device 15 immobile in its position on the rim 11. The enlargement of the angle θ results in a substantially greater clamping pressure being exerted on the rim by the depending leg portions 16 and 18 by their inner walls 16b and 18b. With this greater gripping force, any tendency of the device 15 to move either inwardly of the bowl 10 or laterally along the rim 11 is opposed. As the connective portion 19 is compressed, i.e. as the upper wall 33 is depressed under the influence of the seat 12, there is present a hingeing action or phenomenon in the two leg portions 16 and 18 which serves to prevent lateral movement of the connective portion 19, so that the leg portions 16 and 18 are forced toward each other and nip the bowl.

With reference to Fig. 3, it is seen that the underside of the seat contacts most of the upper wall 33 of the connective portion 19 when this portion is completely depressed. As a result of the arched configuration of section 33, the force transmitted to each of leg portions 16 and 18 is approximately equal as the seat is depressed. While this corresponding force from upper wall 33 is being transmitted to the outside walls 16a and 18a of each leg 16 and 18, the lower wall 34 provides a related function in urging the inside walls 16b and 18b of legs 16 and 18 tighter against each side of the rim. The maximum tension on each leg 16 and 18 is reached at the point where connective portion 19 is fully flattened against the upper margin of the rim.

As is shown from the comparison of Figs. 2 and 3, the unit deforms and moves downward in relation to the rim 11 during compression of the connective portion 19. In conjunction with this deformation movement, the force from the seat is first applied to the region of connective portion 19 which is nearest to the hinges 12a of the seat 12. This "scissors action" from the seat tends to force the complete unit forward on the smooth rim 11 and out of the best spraying position. This is prevented by the nipping due to the interaction of the upper wall 33 and the lower wall 34, as described.

This additional nipping or clamping action occurs on both narrow and wide rims, regardless of rim cross-section. It occurs even if the rim cross-section is tapered inwardly of the bowl (see Figs. 2 and 3) toward the bottom of the rim, so that the legs must spread as the unit is forced downward during compression. It will be appreciated that the gripping action provided by the flattening of the lower wall 34, in conjunction with the deformation of the upper wall 33, prevents shifting in any sense of the entire device 15, whilst affording greater internal compression in the unit in order to eject the fluid contents more rapidly and reliably.

It will be noted that the longitudinal curvature of the bottom wall 34 is of lesser radius

than that of the upper wall 33. This results in greater deformation of the lower wall 34 in order to develop the flat and substantially parallel relationship between the upper and lower walls 33 and 34, allowing maximum compression without restriction.

The illustrated form also solves the problems implicit in developing suitable compression if the hinges 12a (see Fig. 1) become worn. When new, the hinges space the seat 12 say one-half inch above the rim 11. As time progresses, the hinges are worn down, which results in a lesser spacing of the seat relative to the rim 11. In certain instances, this results in developing a "set" in the synthetic plastics material of the device 15, and this problem is effectively avoided through the introduction of the coil springs 36. To accommodate the extensive compression resulting from depressing the seat 12, we find it advantageous to provide telescoping-type coil springs (see Fig. 2, spring 36) which may be of the barrel-envelope type illustrated, or, alternatively, of "hourglass" shape. Thus, the springs 36 are compressible to a very small height without positively impeding movement of the seat 12, and they come to a position of rest by virtue of the hinges 12a contacting the rim 11. This property of the springs 36 can be appreciated by comparing Fig. 2 and Fig. 3. The initial clamping action of the leg portions 16 and 18 relative to the rim 11 can be seen in Fig. 2, where the unstressed position of the leg portions 16 and 18 is represented in chain-dot lines as at 16′ and 18′ (i.e. as before the device is placed in position). The extent of relative outward deformation is designated by the curved arrows θ' and θ'' relating to the legs 16 and 18 respectively in Fig. 2.

The device 15 illustrated provides an advantage in that it touches the rim 11 at only three places or in three regions as can be appreciated from Fig. 2. The inside of each of the leg portions 16 and 18 contacts the bowl rim 11 in only one small area, which allows each leg portion 16 and 18 to slide down each side of the rim 11 with a minimum of friction. This is advantageous in obtaining quick compression and a good spray —experiment with squeezable liquid—dispenser shows that if such is compressed slowly, no effective spray results. The lower wall 34 of the connective portion 19 can, if required, work on a rim 11 having a substantially rounded top section, as contrasted to the flat section shown.

We find it advantageous to provide two springs 36, as indicated in Fig. 1. These springs 36 are located by bosses 37 and 38 (see Fig. 2) which are moulded integrally with the upper and lower walls 33 and 34—roughly at positions of alignment with the centre line of the rim 11.

To develop the required internal compression, we find it advantageous to provide a series of vertically-spaced reinforcing ribs as at 38 in the larger, outer leg portion 18. The ribs 38 are installed against the end walls 29 and 30, extending between the inner and outer walls 27 and 28, respectively, as can be appreciated from Fig. 6.

Exemplary of a specific commercial form is a device 15 having wall thicknesses in the walls 27 and 28 roughly at the mating lines 26 (see Fig. 6) of the order of 0.080″. The end walls 29 and 30 are about 0.60″ thick, and this arrangement, in conjunction with the ribs 38, develops a suitable rigidity to reduce or prevent ballooning when the connective portion 19 is compressed as seen in Fig. 3. The connective portion is constructed of somewhat thinner walls than the remainder, the longitudinal central portion of the connective portion 19 being of the order of 0.040″ thick and thickening gradually as the longitudinal sides are approached, where the wall thickness is of the order of 0.060″.

The leg portions 16 and 18 having substantially square corners, as at 39 in Fig. 6, tending to rigidify the legs against ballooning and localising the compression in the connective portion 19.

The springs 36, in addition to resisting compression of the connective portion 19, also serve as a limit or blocking means to prevent the seat 12 from approaching the rim 11 too closely and thereby collapsing the dip tube 20. The dip tube 20 is seen to lie generally midway between the longitudinal sides of the device 16 (see Fig. 6), and thus the dip tube 20 extends between the springs 36 which are spaced apart in the fashion seen in Fig. 1. The dip tube 20 extends to a point 20a fairly close to the bottom of the longer, outer leg portion 18 (see Figs. 2 and 3) and at its other end is coupled to the nozzle structure generally designated 17.

Interposed in the path of fluid entering the dip tube 20 at 20a and exiting from the nozzle 17 is a non-return valve generally designated 40 (see Fig. 4). For this purpose, a tapered bushing 41 is press-fitted within the discharge end 20b of the dip tube 20. The bushing 41 includes a tapered or shouldered portion as at 41a which serves as an annular seat for the ball 42. The ball 42 is urged against the seat by virtue of a compression spring 43 positioned in the wider portion of the bushing 41. Supporting the lower end of the bushing 41 and confining the compression spring 43 is an adapter 44 equipped with a cup-shaped upper portion 44a and a constricted lower portion 44b.

The valve arrangement is advantageous in that it holds liquid within the dip tube 20, allowing instantaneous spraying, and it prevents leaking due to siphon action which is set up when the level of the liquid in 18 is higher than the nozzle 17 (see Figs. 2 and

3). Further, we find it advantageous to make the main length of the liquid discharge path *i.e.* the dip tube 20, of relatively large internal diameter as contrasted to the constricted portion 44b of the adapter 44. The pressure due to the action of the device when in action opens the valve against the spring 43, forcing the liquid to pass down the stem or constricted portion 44b. In actual practice, the constricted portion 44b has an I.D. of the order of 0.024", so that the liquid flowing in this portion of the fluid discharge path is at a somewhat high velocity.

The lower portion of the adapter 44 is seated within a cup-shaped annular wall 45 provided as an integral part of the nozzle 17. As can be seen in Figs. 5 and 8 the cup-shaped portion is internally of cylindrical shape at 46 and has internally a plurality of longitudinally-extending, circumferentially-disposed groove-forming ribs as at 47. Thus, when pressure is released on the connective portion 19, air enters the liquid-discharge passage 48 and passes upwardly through the grooves between the ribs 47, to replace the liquid discharged from the interior of the device 15.

For the purpose of accommodating the laterally-extending discharge passage 48 (Figs. 4, 5 and 8) which is arranged with its floor at about an 8° angle, the bottom face 49 of the nozzle 17 is recessed as at 50 (see Figs. 4, 5). The discharge passage 48 is advantageously 0.040" wide and has a maximum depth of 0.013", this terminating in an oblique orifice, the orifice being 0.020" square, whence in Fig. 4 a cluster of arrows indicates the fluid discharge.

We have found that a superior spray is achieved if liquid is held in the dip tube practically right to the discharge orifice. Otherwise, a good deal of air and pressure escapes and is lost before the liquid is pumped up the dip tube and atomised. This disadvantage is avoided through the introduction of a valve as at 40.

In the illustration given, the relatively large bore tube 20, as indicated hereinabove, allows greater force against the ball valve element 42 and provides quick spraying action. The small stem or adapter 44 accelerates the velocity of the liquid so conducing to proper atomisation with the air in the mixing chamber.

In conjunction with the valve arrangement whereby the liquid is held throughout the length of the dip tube and adapter, there is provided a small mixing chamber designated 51. This mixing chamber is approximately one-third the volume of standard mixing chambers on the usual "squeeze type" liquid-dispensing bottles. The small size of the chamber serves to restrict the air flow from the dispensing device thereby providing air velocity at the point where the liquid is introduced into the six air streams at the end of adapter 44. This mixing chamber 51 is defined by three equally-spaced abutments such as 51a, 51b (see Fig. 8) moulded on the inside of the nozzle 17, as shown in Figs. 4 and 5, virtually as extensions of alternate ribs 47. These act as spacers to locate the end of the adapter portion 44b, and have an optimum height of about 0.005".

Each of the six grooves 47a defined by the ribs 47 has a width of .020" and a depth of .013" which provides the air when escaping with considerable velocity to atomise the stream which the lower portion of the adapter ejects through a diameter of .024". We have found in this connection that the provision of a mixing chamber having a height of the order of 0.01—0.02" for a dip tube length of the order of 6—12" achieves this advantageous mixing. The air flowing into the chamber is preferably provided by annularly-related passages which may be provided as shown, or alternatively provided as grooves in the outer wall of the dip tube.

While in the foregoing specification a detailed description of the invention has been set down for the purpose of illustration, variations in the details herein given may be made by those skilled in the art without departing from the scope of the claims.

WHAT WE CLAIM IS:—

1. A device for introducing hygienic fluid into a toilet bowl, comprising an unitary elongated U-shaped tubular body constructed of resilient material, said body being defined by a portion connecting depending leg portions, which latter are adapted to extend downwardly inside and outside of a toilet bowl rim, the outer of said leg portions forming a container for the hygienic fluid and the inner leg portion being equipped with a discharge nozzle supplied by a duct from the outer leg portion, the connecting portion having longitudinally arcuate internally concave upper and lower walls forming a cavity between them, the cavity so formed being contracted when the upper wall is pressed upon by a lowered toilet seat and the wall formation being such that the two leg portions then tend to be urged towards each other, the pressure due to the contraction also discharging from the outer leg portion and through the duct a quantity of hygienic fluid through the said nozzle.

2. A device as claimed in claim 1 having a compression spring extending between the upper and lower walls of the connecting portion tending to dilate the said cavity.

3. A device as claimed in claim 2 in which the leg portions have generally rectangular cross-sectional shape.

4. A device as claimed in claim 2 in which the connecting portion is of bulbous shape.

5. A device as claimed in any of the preceding claims in which the said duct is a

tube extending substantially throughout the length of the leg portions connecting portion and having one end coupled to a structure including a nozzle at one end and a non-return valve mounted in the said tube adjacent to the said end thereof.

6. A device as claimed in claim 5 in which the nozzle incorporates longitudinally-extending grooves for the passage of air.

7. A device as claimed in any of the preceding claims in which the nozzle includes a cup-shaped member the cylindrical wall of which is provided internally with a plurality of longitudinally-extending ribs defining grooves for the passage of air.

8. A device as claimed in claim 7 in which the nozzle incorporates an air and liquid mixing chamber.

9. A device as claimed in any of claims 5—8 in which the interior tube has a length of from about six inches to twelve inches and the mixing chamber has a height of the order of 0.01 to 0.02 of an inch.

10. A device for introducing hygienic liquid into a toilet bowl arranged and adapted to operate substantially as hereinbefore described with reference to the accompanying drawings.

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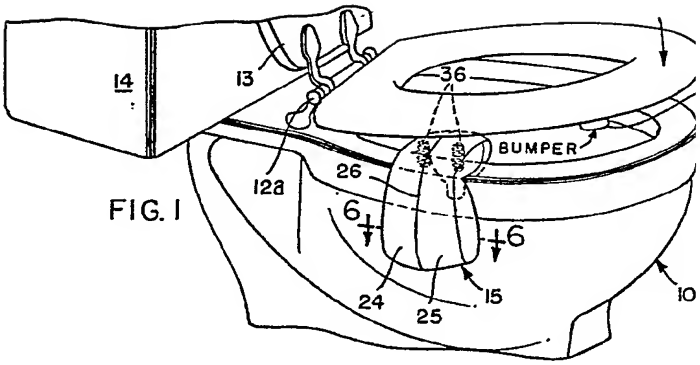
14
13
36
BUMPER
26
12a
6
6
24
25
15
10

FIG. 1

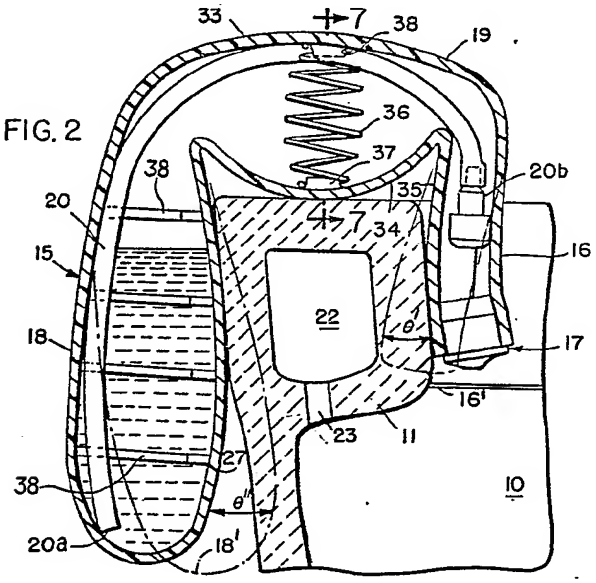
33
7
38
19
36
37
38
20b
35
20
7
34
15
16
22
θ'
18
17
16'
23
11
27
38
θ'
10
20a
18'

FIG. 2

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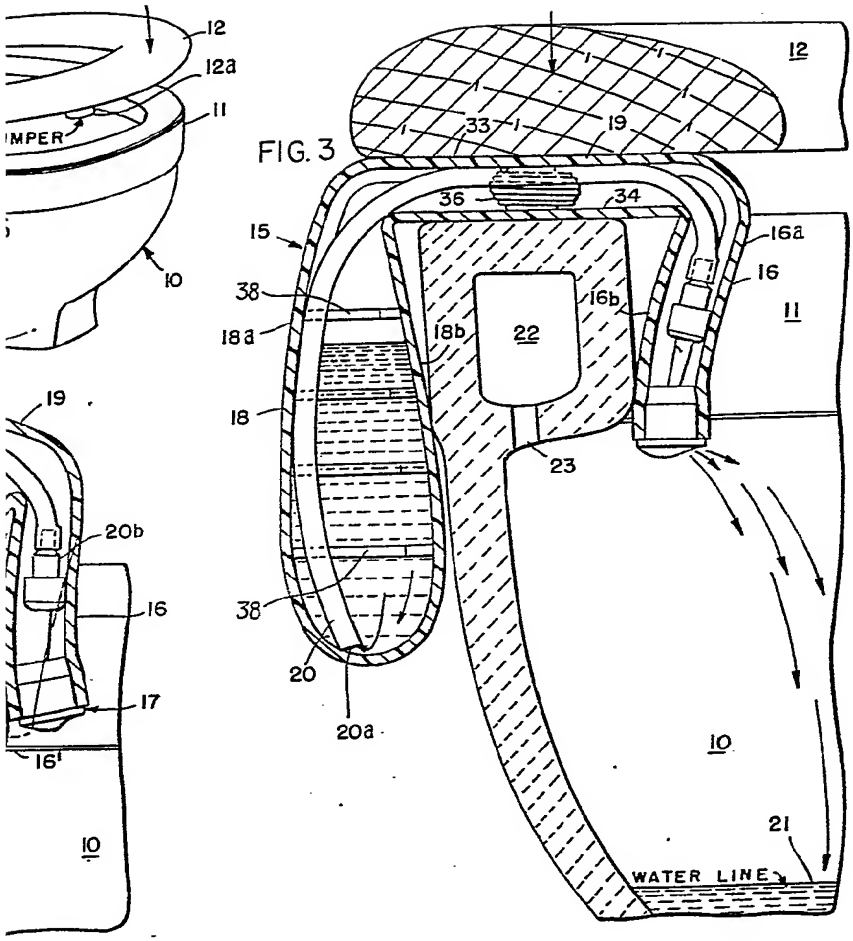
Sheet 1

FIG. 3



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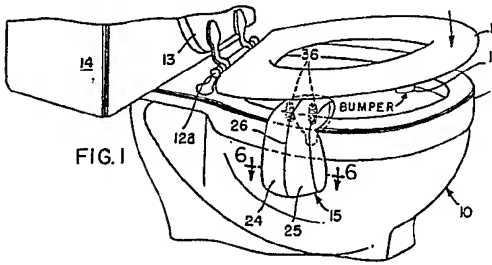


FIG. 1

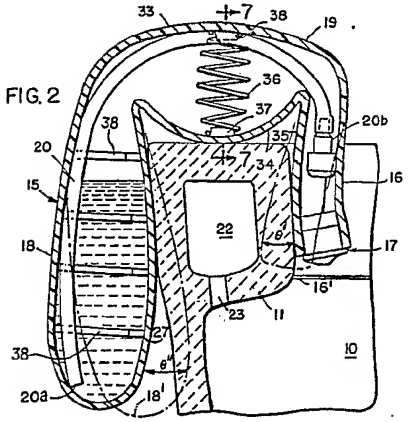


FIG. 2

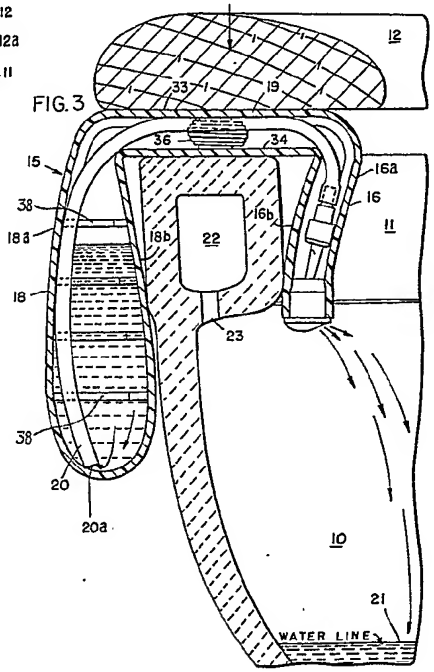


FIG. 3

FIG. 4

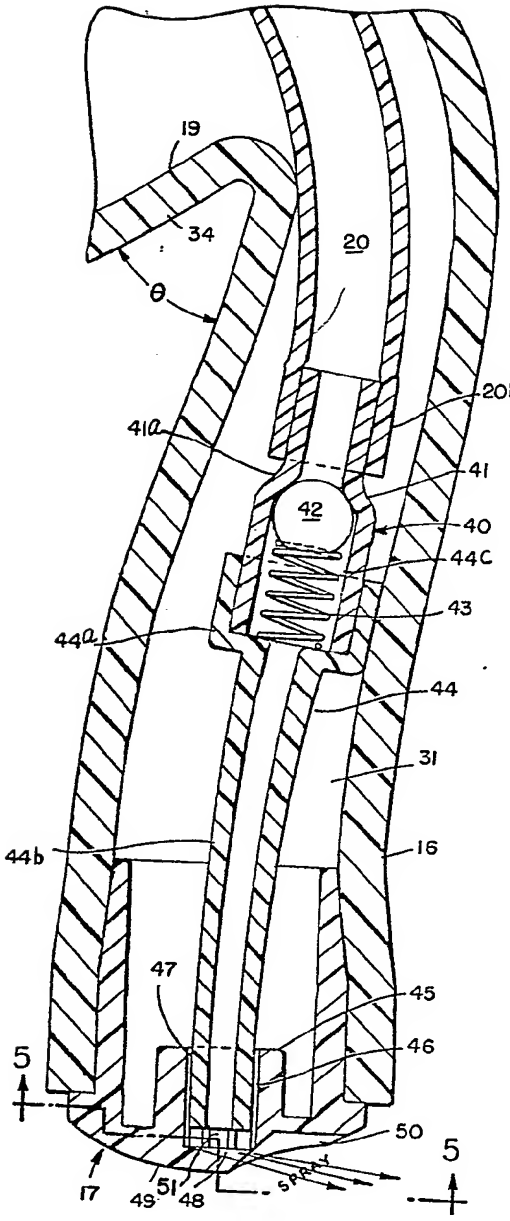


FIG. 6

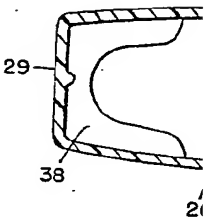
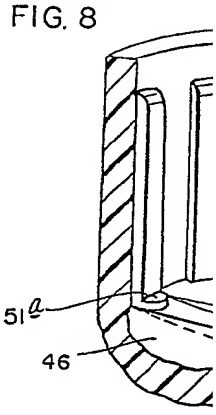


FIG. 8



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IG. 4

FIG. 5

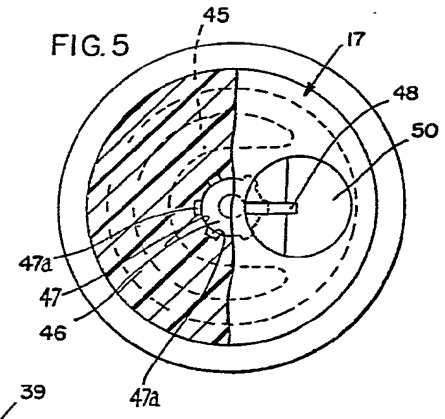


FIG. 6

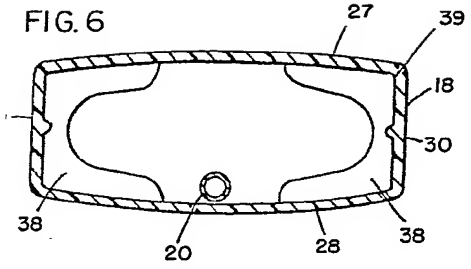
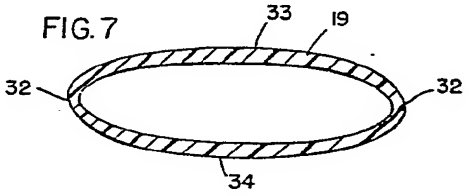


FIG. 7



G. 8

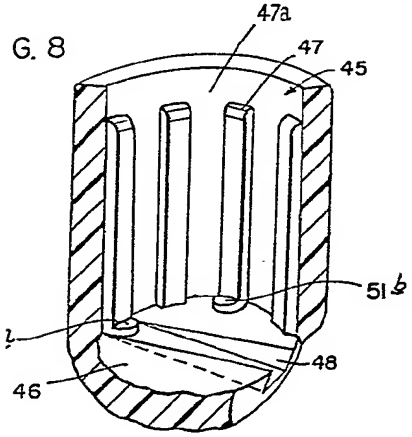


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FIG. 4

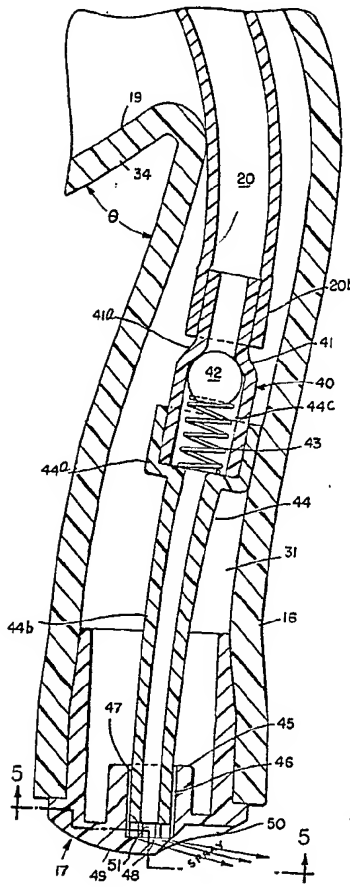

FIG. 5

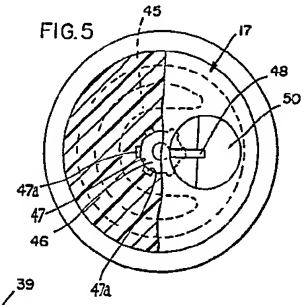

FIG. 6

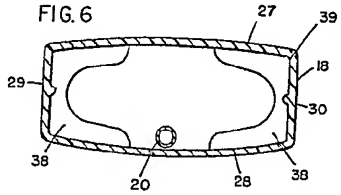

FIG. 7

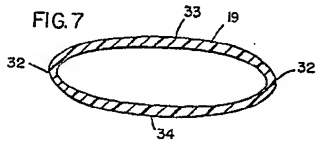

FIG. 8